EXHIBIT 2

Expert Report of William E. Longo, Ph.D., Prepared on Behalf of the Property Damage Asbestos Claimants Represented by the Law Firm of Dies & Hile, LLP

October 25, 2006

MAS

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QUALIFICATIONS

William E. Longo, Ph.D.

I have a Bachelor of Science degree in Microbiology, a Masters of Science in Engineering and a Doctorial of Philosophy in Material Science and Engineering, all from the University of Florida. After receiving my Ph.D. in 1983, I remained at the University of Florida and became a visiting Assistant Professor in 1985 in the Material Science & Engineering Department. While at the University of Florida, my research included the characterization of cancer drug targeting molecules by electron microscopy. From this research, I hold a patent for the synthesis of protein microspheres for the drug targeting applications.

In 1983, I founded Micro Analytical Laboratories (MAL) Inc., which became one of the first commercial labs in the country to provide Transmission Electron Microscopy (TEM) analysis of asbestos-containing air and dust samples. I left MAL in 1987 to become President of Materials Analytical Services (MAS), Inc. headquartered in Atlanta, Georgia. In addition to Atlanta, MAS has offices in Raleigh, North Carolina, Phoenix, Arizona, Santa Clara & Los Angeles, California and Washington D.C. MAS specializes in the characterization of materials for the following industries: Environmental, Industrial Hygiene, Building and Construction Products, Electronics, and Semiconductors.

Currently, over 25% of MAS's staff has their Ph.D.'s in a wide range of scientific disciplines. The technical group at MAS includes Industrial Hygienist, Certified Industrial Hygienists, geologists, biologists, microbiologists, environmental chemists, material scientists, physicists, surface chemistry specialists and polymer chemists. The MAS laboratories in Atlanta and Raleigh contain state-of-the-art electron microscopes, two of which are capable of magnifying samples up to 3 million times.

MAS has provided laboratory analysis and consulting services to a wide range of private, public, and government entities. These groups include NASA, the Center for Disease Control, NBC, the University of Tokyo, IBM, FAA, GSA, NATO, the National Institutes of Health, W.R. Grace, Celotex, Intel, and the EPA, to name a few. MAS has extensive experience over many years in the analysis of bulk samples of asbestos for purposes of performing micro-analytical product identification. MAS performed this analysis on thousands of bulk samples of asbestos containing fireproofing and acoustical material ("Surface treatment ACM") for a variety of companies. MAS was selected as an Approved Laboratory by several bankruptcy trusts. MAS also provided product identification analysis for the State of Hawaii, State of Texas, State of Utah, State of New York, the City of New York, City of Boston, and the Port Authority of New York and New Jersey.

The product identification consulting work I have performed was in the context of litigation and involved the materials characterization of unknown surface treatment ACM. Typically such analysis requires that a bulk sample of ACM be analyzed with a variety of analytical

techniques to determine the constituent ingredients and their proportionality, which are then compared to the manufactures' known product formulas as well as to information regarding application techniques which may have varied with the formulas or products.

I and MAS have also provided consulting and analytical services to former asbestos manufacturers, which included W.R. Grace's Construction Products Division. This work involved a request by W.R. Grace ("Grace") that MAS analyze air samples collected by Grace during the spraying of Fireproofing for tremolite/actinolite airborne fiber levels.1 W.R. Grace sought to learn if the tremolite/actinolite contamination in the vermiculite would be airborne during the spraying process. Because of the overloading of the air samples by the vermiculite, the W.R. Grace representatives requested that all the air samples be analyzed by the indirect method. This work was not done for litigation purposes.

I was a member of the Environmental Protection Agency (EPA) Peer Review Group, which consisted of five members who peer reviewed the EPA's findings in their ongoing asbestos research with regard to asbestos in building issues. The Peer Review Group provided the EPA with guidance for their continuing asbestos research, and with insight regarding new issues that needed to be addressed. I was also a member of an EPA panel that drafted the micro-vacuum ("Microvac") asbestos dust method in 1989 that measured asbestos surface contamination. I served as both Vice Chairman and Chairman of the TEM Analytical Committee for the National Asbestos Council ("NAC"). I am the primary author of the American Society for Testing and Materials (ASTM) D-5755-95 Dust Sampling Method for the Quantification of Asbestos Surface Contamination ("ASTM D-5755 Dust Sample Method") that was approved and promulgated as an ASTM standard method in 1995. For my leadership role in developing the ASTM dust method, I was presented an Award of Appreciation by the D-22 Committee on Sampling and Analysis of Atmospheres.

I have been qualified as an expert in both State and Federal court as a material scientist, an electron microscopist and with regard to the use of optical and electron microscopy for the characterization of asbestos-containing products and as an industrial hygienist relating to asbestos issues.

My billing fee for consulting, depositions, and trial testimony is $300.00 per hour. My opinions which are described in this report are based on my experience as a materials characterization scientist, my review of the scientific literature and the data, tests and other information which are reviewed, discussed and referenced in this report. These opinions are expressed to a reasonable degree of scientific certainty.

Report Overview

It is the position of W.R. Grace and their experts that any release of asbestos-containing dust from their in-place asbestos-containing surface treatment products in buildings is encapsulated and in the particle size range that is not readily respirable by building occupants or maintenance personnel. As discussed and referenced extensively in my previous expert report (December 8, 2005) there is an abundance of published and unpublished field data collected by MAS and other environmental consultants that refutes

[1] John J. Henningson, W.R. Grace & Co., personal communication. William E. Longo, Ph.D., Materials Analytical Services, Inc., personal communication.

this erroneous claim by W.R. Grace. This expert report provides additional analytical information that demonstrates the inaccuracy W.R. Graces's expert's opinions about the ASTM D-5755-3 Dust Sample Method.

Executive Summary of Opinions

1. Analysis of dust, direct air and surface contact samples collected from buildings containing W.R. Grace asbestos-containing surface treatment products are shown to contain free "non-encapsulated" chrysotile asbestos fibers, bundles and clusters ("asbestos structures"). Measurement of the length and width of these "free" asbestos fibrous structures indicate that most of the fibers were in the respirable size range. Additionally, comparison of the chrysotile structure size range from direct air samples taken during the disturbance of Monokote-3 surface dust in the Tucson building study shows show good statistical agreement with a number of surface dust samples collected in buildings in Arkansas. This demonstrates that the ASTM D-5755-3 Dust Sample Method preparation procedure does not bias asbestos fiber counts to higher surface number concentrations during the sample preparation procedure as stated by W.R. Grace's expert, Dr. Richard Lee.

2. A recent study conducted by our group at the Tucson Convention Center (TCC) Music Hall and a previous study done at the Lancaster Keist Branch Library (both buildings contain W.R. Grace Monokote-3 fireproofing) demonstrated that when the Monokote-3 dust was disturbed, free respirable asbestos structures were disbursed into the breathing zone of the workers performing the study as measured by the direct air sample method. The size distribution of the Monokote-3 chrysotile fibers collected in the direct air samples from the TCC building were slightly statistically shorter than the asbestos fiber lengths measured in previously analyzed dust samples collected from under the in-place Monokote-3 fireproofing in that building.

3. The TCC Music Hall and the Lancaster Keist Branch Library direct air and dust analysis comparison studies demonstrate that the W.R. Grace in-place asbestos-containing surface treatment products release free respirable asbestos structures into the dust and that the ASTM D-5755 Dust Sample Method provides an accurate index of asbestos contamination for surface dust samples.

4. Air samples collected from the TCC Music Hall and Lancaster Keist Branch Library were analyzed by the NIOSH 7400 method using phase contrast microscopy (PCM). The results showed that when Monokote-3 surface dust was disturbed and it entered into the breathing zone of the study investigators, they were exposed to significant amounts of airborne fibers. The dispersal of asbestos-containing surface dust deposited from in-place W.R. Grace asbestos-containing surface treatment materials is a potential exposure hazard for any building occupant or maintenance worker who disturbs these materials.

5. Direct dust samples were collected (using a tape lift type procedure) from a group of Texas buildings with W.R. Grace asbestos-containing surface treatment materials. The samples were analyzed to determine the characteristics of the asbestos fibers found in the surface dust. This method is not suitable to determine quantitatively the amount of asbestos fibers present in the surface dust due to non-uniform particle loading on the filter surface. But what these samples did demonstrate is that non-encapsulated free

respirable asbestos fibers were present in the surface dust. The results from the Texas direct dust samples coupled with the direct dust samples discussed in my December 8, 2005 expert report further demonstrate that free respirable asbestos fibers are released from in-place asbestos containing W.R. Grace surface treatment products and those fibers contaminate surfaces in the general vicinity of the in-place material.

6. Surface dust samples recently collected and analyzed by the ASTM D-5755 Dust Sample Method from buildings in Texas and Arkansas, all of which contained in-place W.R. Grace asbestos-containing surface treatment materials, showed high levels of asbestos surface contamination. These results are consistent with dust sample results from numerous other buildings across the country that contain in-place W.R. Grace asbestos-containing surface treatment materials and they illustrate further how pervasive this problem is with W.R. Grace's asbestos-containing building products.

Introduction

Dr. Richard Lee (expert for W.R. Grace) provides opinions that the ASTM D-5755-3 Dust Sample Method will dissolve encapsulated asbestos-containing particulates and break large asbestos structures into smaller respirable asbestos fibers thereby artificially inflating surface asbestos number count concentration. Dr. Lee claims that the dust that has accumulated under W.R. Grace ACM products, such as Monokote-3 fireproofing, does not contain free respirable asbestos structures only large asbestos containing particulates.

If Dr. Lee's opinion that the presence of free respirable asbestos structures found in the ASTM Dust Sample Method analysis is caused by the indirect preparation method, which he claims dissolves and breaks up large (non-respirable) asbestos containing particles, is correct, then an examination of W.R. Grace's asbestos-containing fallout dust by a direct preparation method should yield no respirable size asbestos structures. One way to examine the surface dust by the direct preparation method is to reentrain (to make airborne) asbestos-containing surface dust into the air while collecting air samples during the dust disturbance activity.

In order to determine the validity of Dr. Lee's criticism of the ASTM D-5755 Dust Sample Method, MAS personnel performed a series of studies involving the analysis of direct air, indirect dust and direct dust samples by collecting the reentrained Monokote-3 surface dust as well as the dust created by W.R. Grace in-place asbestos-containing surface treatment products from contaminated building surfaces. These studies were designed to directly characterize what the asbestos structures look like in surface dust. The studies were as follows:

1. Tucson Convention Center (TCC) Music Hall attic study. MAS' personnel visited the TCC music hall where they performed four activities that caused settled dust on surfaces to become reentrained into the breathing zone of the workers performing the work activities. Direct air samples (AHERA style) were collected and analyzed and compared to previously analyzed surface dust samples. The sprayed fireproofing in the TCC Music Hall attic was identified as W.R. Grace Monokote-3 fireproofing.

2. Lancaster Keist Branch Library study. In 1991 a work practice study was performed in the Library where ceiling tiles were removed and replaced (a copy of the Lancaster study is attached to this report as Appendix A). Archived air samples from that study were retrieved and analyzed at our laboratory by both the NIOSH 7400 method (PCM) and the

AHERA style TEM direct method. The TEM air sample analysis was then compared to the indirect dust sample analysis collected during that study in 1991.

3. ASTM 5755-3 surface dust samples were recently collected from a series of buildings in both Texas and Arkansas that had W.R. Grace in-place asbestos-containing surface treatment products in place. Additionally direct dust samples were taken from three buildings from Texas using a tape lift type technique. The tape lift samples were analyzed by a direct TEM procedure and representative photomicrographs were taken of non-encapsulated respirable asbestos fibers.

Tucson Experiment
(fireproofing dust reentrainment)

<u>Purpose</u>

MAS designed and conducted the following study:

1. To evaluate the asbestos fiber reentrainment potential of settled dust associated with W. R. Grace's Monokote-3 fireproofing
2. To assess the asbestos fiber size distributions of reentrained particulates obtained during personal air sampling as compared to those found in settled dust samples.
3. To assess air samples from reentrained asbestos-containing dust by direct prep methods as a means of demonstrating the presence of free asbestos fibers captured on the filter.
4. To further determine whether W. R. Grace's expert's contention that deposits of settled surface dust from their in-place products are not of a respirable size range and that all asbestos fibers contained in dust from their products are encapsulated is correct.

<u>Building</u>

The Tucson Convention Center (TCC) Music Hall was selected as the site of the study experiment. It is located in the downtown section of Tucson, Arizona at 260 South Church Avenue. The facility is an approximately 5-story steel framed masonry and concrete building that is utilized as a music/opera/recital hall. W.R. Grace's Monokote-3 fireproofing was applied to structural steel members, I beams and corrugated metal pan decking throughout the building. In addition considerable overspray of the fireproofing application was noted on the concrete block walls, catwalk hand rail, HVAC equipment and ceiling hangers throughout the attic space.

This fireproofing application is easily accessible thru the 5th floor attic (located above the general seating area of the hall). The attic space houses a variety of HVAC and lighting equipment which is accessible by a series of interconnected catwalks (refer to photographs 1 and 2).

Inspection of horizontal surfaces below the sprayed decking and beams showed evidence of fireproofing dust in the attic. Most surfaces were covered with a layer of fine dust and in sporadic areas throughout the space pea sizes to fist size chunks of fireproofing debris were also present.

Access to the attic is through a locked doorway off the north stairwell. The stairwell and attic areas are clearly marked with Asbestos Hazard Signs. According to the building engineers and City of Tucson environmental personnel: no significant renovation work or asbestos abatement work has taken place in the building.

MAS selected a holiday (Columbus Day 10/09/06) to conduct the subject experiment. On this day the facility was closed to the public and the HVAC system was turned off.

Materials & Methods

Location & Parameters of Dust Reentrainment Trials

Following a brief visual inspection of the attic space above the Music Hall, MAS selected an area just inside and to the left of the 5th floor stairwell access door for the first three of four trials. This area provided easy accessibility to broad sections of the HVAC system ductwork. The fourth trial was conducted in an area located near the center of the attic accessed by catwalks.

The basic design for this experiment consisted of the collection of personal air samples during reentrainment of settled dust from Grace Monokote-3 fireproofing. Four separate trials were performed to reentrain the dust present in the attic space. Each trial relied on a different mechanism for disturbance of the dust. In general these reentrainment mechanisms were similar to disturbance caused by simple maintenance activities.

Two study investigators from MAS participated in each trial of the experiment. Both experiment participants wore disposable protective coveralls and donned full-face powered air-purifying respirators. In addition, each participant donned two low volume personal air sampling pumps with attached 25mm mixed cellulose ester (MCE) filters on either shoulder. With this configuration a total of four air samples were obtained for each trial. Samples were collected in the breathing zone for each participant at flow rates of 1.5 and 2.5 liters per minute respectively for each sample. The sampling period for each trial was limited to the actual time necessary to perform the given disturbance.

Trial I – *Rag Cleaning*
In this trial, settled dust was reentrained into the air by use of a cloth rag. Newly purchased cloth rags were used by experiment participants to manually remove the accumulated dust from the top of a metal HVAC duct. The duct selected for this trial is trapezoidal in shape with the approximate dimensions of 26" top x 42" bottom x 38"sides. Light hand pressure was applied to the rags to remove the dust via broad sweeping arm motions over the entire duct surface area. During the trial, one half of the duct surface was cleaned by one participant and then the opposite side was cleaned by the other participant (refer to photographs 3 thru 6). Air samples were collected during this trial over a four minute period.

Trial II – *Hand Brushing*
In this trial, settled dust was reentrained into the air using a small hand brush and dust pan. A newly purchased brush and pan were used to manually remove the accumulated dust from the top of a metal HVAC duct. The duct selected for this trial is trapezoidal in shape with the approximate dimensions of 26" top x 42" bottom x 38"sides. Light hand pressure was applied to the brush to sweep the dust off one-half of the duct surface using long brush stokes. The opposite half of the duct surface was then cleaned by the other participant, this time using moderate hand

pressure and short brush strokes. The accumulated dust captured in the dust pan was subsequently deposited into a Ziploc bag and retained for future analysis (refer to photographs 7 thru 10). Air samples were collected during this trial over a four minute period.

Trial III – *Compressed Air Blow Off*
In this trial, settled dust was reentrained into the air using a small canister of compressed air. The air from the canister was used to blow off the accumulated dust from the top of a metal HVAC duct. The duct selected for this trial is rectangular in shape with the approximate dimensions of 47" wide x 54" tall. Compressed air was released from the can at a distance of approximately 18" and at approximately 45 degree angle from the duct surface. From this distance the compressed air produced a wind velocity of 75 to 100 feet per minute. One half of the duct surface was blown off by one participant and then the opposite side was blown off by the other participant (refer to photographs 11 thru 14). A total of 109 grams of compressed air were used. Air samples were collected during this trial over a four minute period.

Trial IV – *Insulation Batt Removal and Replacement*
In this trial, settled dust was reentrained into the air by lifting and replacement of fiberglass batt insulation. Pink colored fiberglass insulated batting (in 24" x 48" sections) are utilized in the attic space above the music hall ceiling. Two of these insulation batts were removed from their installed locations by each of the experiment personnel and were temporarily placed atop adjacent batting to provide access the ceiling deck below. After approximately one minute the removed batts were placed back in their original location (refer to photographs 15 and 16). Air samples were collected during this trial over a four minute period.

Analysis

Following the conclusion of the study, air samples obtained during the four trials were transported back to MAS's Suwanee, Georgia laboratory and submitted for analysis.

Phase Contrast Microscopy
A quarter wedge was removed from each of the 16 air samples and prepped for analysis by Phase Contrast Microscopy (PCM) in accordance with the National Institute of Occupational and Safety Health Administration (NIOSH) 7400 method[2]. The results of these analyses were reported in structures per cubic centimeter of air.

Transmission Electron Microscopy
A portion of the remaining filter from each of the 16 air samples was prepped following MAS's SOP "Direct Preparation Methodology for Air Filter Analysis by Transmission Electron Microscopy (TEM)". Two grids from each of the filters were then analyzed in accordance with Environmental Protection Agency's (EPA) AHERA style methodology[3]. During this analysis fiber sizes (lengths and widths) were recorded for each of the asbestos structures counted. In addition, representative photographs were taken of each sample to document filter loading, fibers sizes and presence of free asbestos structures. Calculated asbestos fiber concentrations are reported in asbestos structures per cubic centimeter of air.

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[2] National Institute for Occupational Safety and Health (NIOSH); Asbestos and Other Fibers by PCM Method 7400, NIOSH Manual of Analytical Methods 4th ed., DHHS (NIOSH) Pub. No. 94-113, NIOSH, Cincinnati, OH (1994).
[3] Environmental Protection Agency (EPA): Electron Microscope Measurement of Airborne Concentrations. EPA-60012-77-178. EPA, Washington, D.C. (1987).

Statistical Analysis of Air and Dust Samples
The lengths and widths of the asbestos fibers measured and counted in the direct TEM air samples were compared to the asbestos fiber sizes from previous surface dust samples collect from the TCC Music Hall attic as well as to the surface dust samples collected form the various buildings in Arkansas that are contained in this report.

Results

The direct PCM and TEM results for the air samples are shown in Tables 1 through 4. Briefly the PCM results are as follows:

The rag cleaning study had a PCM range of less than 0.45 f/cc to 8.43 f/cc. For the hand brushing study the PCM results had a range of 0.64 f/cc to 6.62 f/cc. The compressed air study resulted in a range of 5.82 f/cc to 8.56 f/cc and the insulation removal study had a range of 1.92 f/cc to 8.51 f/cc. The data for these analyses are attached as appendix A to this report.

Table 1
Tucson Rag Cleaning Study

Sample ID	PCM Fibers/cc	TEM Structures/cc Total	TEM Structures/cc >5.0 microns
1	<0.45	4.19	0.60
2	1.74	12.22	1.08
3	8.43	54.36	7.94
4	5.07	33.79	2.88

Table 2
Tucson Hand Brushing Study

Sample ID	PCM Fibers/cc	TEM Structures/cc Total	TEM Structures/cc >5.0 microns
5	0.65	16.49	1.22
6	0.64	12.22	1.80
7	6.62	17.97	4.34
8	2.55	14.88	3.27

Table 3
Tucson Compressed Air Study

Sample ID	PCM Fibers/cc	TEM Structures/cc Total	TEM Structures/cc >5.0 microns
9	8.56	35.23	8.39
10	5.82	7.97	1.00
11	5.89	15.02	5.84
12	7.96	22.31	6.45

Table 4
Tucson Insulation Removal Study

Sample ID	PCM Fibers/cc	TEM Structures/cc Total	TEM Structures/cc >5.0 microns
13	1.92	26.26	3.01
14	5.84	27.28	4.48
15	8.51	90.31	15.94
16	5.83	21.30	4.11

The five ASTM D-5755-3 surface dust samples taken at the TCC Music Hall attic by Mr. William Ewing on August 17, 2005 were analyzed by MVA Scientific Consultants in September of 2005. A report of those findings is attached as Appendix B.

Asbestos Fiber Distribution Comparison

Fiber lengths of directly prepared air samples were compared to fiber lengths of dust sampled prepared by the ASTM D5955 method. The air samples were collected in the attic of the Tucson Music Hall during the disturbance of WR Grace fireproofing dust. The surface dust samples were collected in a series of Arkansas buildings that contained WR Grace asbestos-containing products. The fiber length data appeared to be exponentially (log normal) distributed. The fiber width appears normally distributed and had mean widths that were nearly identical. Therefore, the fiber lengths of dust and air samples were logarithmically transferred to create more normal distribution data. The two sets of data were tested using standard statistical analysis of variation (ANOVA) to determine if there was any statistical difference in the fiber length data. The analysis demonstrated no statistical difference. The air samples from the Tucson Music Hall were compared to five previously collected dust samples at the Tucson Music Hall (MVA). In the comparison, the Tucson Music Hall dust fibers were slightly longer and wider than those fibers counted in the direct air samples collected in the same building.

Table 5
Fiber Size Comparison Dust vs. Air

Project	Number of Structures	Average Structure Length	Average Structure Width
Dust Sample from Arkansas Buildings Appendix F M40543	1643	3.5	0.16
Air Samples Tucson Music Hall Appendix A M40816*	752	3.1	0.16
Dust Sample from Tucson Music Hall Previously Analyzed by MVA	84	4.3	0.34
Air Samples (1) from Lancaster Library*	160	2.2	0.11
Dust Samples (2) from Lancaster Library	200	4.5	0.06

* Air samples prepared using the direct method

Lancaster Keist Branch Library

Purpose

In 1991 a group headed by Mr. William M. Ewing, CIH, performed a ceiling tile replacement work practice study at the Lancaster Keist Branch Library. A full description of the study can be found in Appendix C of a report dated December 31, 1991 entitled "Replacement of Ceiling Tile and Associated Cleaning Activities in the Vicinity of Asbestos-Containing Fireproofing" written by Mr. William M. Ewing, CIH. The asbestos-containing fireproofing has been previously identified as W.R. Grace's Monokote-3.

This study and data were also published in a peer reviewed journal (Applied Occupational Environmental Hygiene) by Keys et al. in 1994[4].

Briefly the work practice study entailed the removal and replacement of 20 1'x 1' ceiling tiles under the Monokote-3 fireproofing. After the tile removal and replacement procedure had been completed the dust and debris were cleaned up from the surrounding area. Air and dust samples were collected during the study.

The air samples were analyzed by the EPA level II indirect method and the dust samples were analyzed according to the draft ASTM D-5755 Dust Sample Method. A total of 28 air samples were collected during the study. 23 of the samples were analyzed by the indirect EPA method and five were archived and not analyzed. The five air samples consisted of two background samples (10/9/91-02 & 10/10/91-08) while the other three were area air samples taken during the work practice activity. These five air samples were recently retrieved by Mr. Ewing and sent to MAS for analysis by PCM using the NIOSH 7400 PCM method and TEM using the direct

[4] Keys, D.L.; Ewing, W.M.; Hays, M.S.;et al.: Baseline Studies of Asbestos Exposure During Operations and Maintenance Activities. Appl Occup. Environ Hyg 9(11):853-860 (1994).

method with AHERA style asbestos fiber counting rules. Dust samples that were collected after the tile replacement activity were analyzed by MAS using the draft ASTM dust method with AHERA counting rules. Since AHERA counting rules only size asbestos structures with a less than or greater-than five micron size criteria, two archived prepared grids were re-analyzed for the presence of respirable asbestos structures in 200 random asbestos structures were sized by length and width. The purpose of this was to obtain an appropriate data set from the dust samples that could be compared to the direct TEM air analysis for the presence of respirable asbestos structures. However, since these were area air samples and not personal air samples they may be inappropriate for fiber length comparisons.

Materials & Methods

The five air samples were delivered to MAS by Mr. William E. Ewing on October 19, 2006 all five samples were first analyzed by PCM using the NIOSH 7400 method. An additional ¼ section of the filter was then prepared for TEM analysis by the direct method. AHERA style counting rules were used which require the measurement of both the fiber length and width for each asbestos structure counted. Only asbestos structures that were greater then 0.5 microns in length and had an aspect ratio of 5 to 1 were counted in this analysis.

In the original Lancaster Library study the surface dust samples were collected from nine locations on the carpet floor. The collection was done after the replacement of the ceiling tiles but immediately before the cleaning activity was to begin. Eight of the dust samples were sent to MAS for analysis using the Draft ASTM D-5755 Dust Sample Method. For those dust samples, MAS used a strict AHERA counting rule which only classifies asbestos structure sizes as greater than or less than 5.0 microns. This sizing criteria is not suitable for comparison to a data set where asbestos structure lengths and widths are measured directly such as with direct air sample analysis discussed in the above paragraph. For this reason two archived dust grid samples (m-7322-001 & M-7322-007) from our original analysis were re-analyzed. Because of the condition of the carbon film on the 15 year old samples the only analysis possible was to count and size 100 random asbestos structures from each of the samples.

Statistical Analysis of Air and Dust Samples

The lengths and widths of the asbestos fibers measured and counted in the direct TEM air sample that was analyzed was compared to the asbestos fiber sizes from the two surface dust samples that were re-analyzed from this study. However, because these were area air samples and taken away from the work activity, there may be a decrease in the average fiber size as compared to the dust analysis.

Results

The PCM results for the three area air samples had a range of 0.129 f/cc to 0.416 f/cc using the A counting rules for the NIOSH 7400 method. For the direct TEM air sample analysis only one of the three samples could be analyzed due to particle over loading problems. In the original analysis for the study overloading was not a problem due to the use of the indirect sample preparation procedure. The results of the one sample analyzed (10/10/91-29) showed an asbestos structure concentration of 10.48 str/cc. A summary of the air sample results are shown in Table 6.

Table 6
Lancaster Keist Branch Library

Sample ID	PCM Fibers/cc	TEM Structures/cc	
		Total	>5.0 microns
10/9/91-02	0.012	---	---
10/10/91-02	0.129	---	---
10/10/91-23	0.133	---	---
10/10/91-29	0.416	10.48	0.52
10/10/91-08	0.0027	---	---

All the data for the PCM, TEM air and dust analysis are contained in Appendix D of this report.

Texas Buildings Surface Dust Analysis

Purpose

In September of this year an MAS consultant visited four buildings in Houston and Amarillo Texas to collect surface dust samples from areas in the vicinity of W.R. Grace in-place asbestos-containing surface treatment materials. These samples were collected in accordance with the ASTM D-5755-3 Dust Sample Method. These dust samples were collected to evaluate the current asbestos contamination on surfaces in buildings that still contain W.R. Grace asbestos-containing materials. Both fireproofing (Monokote-3) and acoustical plaster materials (Zonolite Acoustical Plaster) were evaluated. Also an additional three buildings were chosen for direct dust tape lifts for asbestos structure characterization analysis.

The buildings chosen were as follows:

1. El Paso Building
2. Public Works Building
3. Amarillo Air Terminal
4. Bivins Building-Chamber of Commerce

Materials & Methods

Each building was inspected and areas inside the building were chosen that represented typical surface areas under the in-place W.R. Grace asbestos-containing fireproofing or acoustical plaster. All dust samples were collected in general accordance with the ASTM D-5755 Dust Sample Method.

For the direct dust sample collection the El Paso, Amarillo Air Terminal and Bivins buildings were chosen. Samples were collected as follows: 47 mm MCE filters in clean sample holders were taken to each of the three buildings. After an appropriate surface area was chosen the filter was removed from its holder and slightly moistened with a solution of 50/50 mixture of alcohol and water. The wet side of the filter was then placed on the surface and applied with light hand

pressure for 30 seconds. The filter was carefully removed and replaced in the sample container, and then hand carried to MAS for TEM analysis. The MCE filter was prepared for TEM analysis in a clean area of the laboratory designed for surface dust preparation. In a dedicated HEPA filtered hood, the sample container was opened, and several representative areas of the filter were removed with a sharpened cork boring tool. Both heavy and lightly loaded areas of the filters were visible. The filter sections were prepared using the TEM direct preparation technique. The direct dust samples were examined by TEM at various magnifications to determine the distribution and particle loading. Photomicrographs of representative areas of the filter were taken.

Results

ASTM D-5755 Dust Sample Analysis

The results for the surface dust samples collected and analyzed by the ASTM D-5755 method are located in Appendix E of this report. All results, count sheets, photographs, and areas of the building sampled can be found in this index. In 14 our of 17 surface samples the asbestos contamination levels on the surface samples were found to be mostly in the extreme contamination range. That is, the asbestos concentration for these samples was greater than 1 billion asbestos structures per square foot or 1 million asbestos structures per square centimeter.

Direct Dust Sample Analysis

Using the direct preparation method free respirable-size chrysotile structures were observed and photographed in the samples that were analyzed. These asbestos structures were shown to be non-encapsulated.

Arkansas Buildings Surface Dust Analysis

Purpose

In September of this year a MAS consultant visited four building complexes in Arkansas in order to collect surface dust samples from areas in the vicinity of W.R. Grace in-place asbestos-containing surface treatment materials. These samples were collected in accordance with the ASTM D-5755-3 Dust Sample Method. These dust samples were collected to evaluate current asbestos contamination on building materials that still contain W.R. Grace asbestos-containing materials. Both fireproofing (Monokote-3) and acoustical plaster materials (Zonolite Acoustical Plaster) were evaluated.

The buildings chosen were as follows:
1. Benton Service Center-Maintenance Bldg 18
2. SBS Building
3. Office of Child Services
4. Arkansas State Hospital (9 buildings)

Results

ASTM D-5755 Dust Sample Analysis

The results for the surface dust samples collected and analyzed by the ASTM D-5755 method are located in Appendix F of this report. All results, count sheets, photographs, and areas of the building sampled can be found in this index. In 16 out of 28 surface dust samples the asbestos contamination levels on the surface samples were found to be mostly in the extreme contamination range. That is, the asbestos concentration for these samples were greater than 1 billion asbestos structures per square foot or 1 million asbestos structures per square centimeter. One sample out of the 28 was found not to contain asbestos.

Project Photomicrographs

All the photomicrographs of representative asbestos structures found in the direct air, ASTM dust samples and the indirect dust samples can be found in Appendix G of this report.

Conclusion

Dr. Lee has provided expert opinions in the past that asbestos contaminated dust fall out from in-place W.R. Grace asbestos-containing surface treatment products only consist of large non-respirable asbestos-containing particles. Therefore according to Dr. Lee, when dust samples are collected in the vicinity of these W.R. Grace ACM materials, using the ASTM D-5755 Dust Sample method, the preparation procedure dissolves encapsulated asbestos structures and breaks up such alleged non-respirable particles thus producing an artificial asbestos concentration. It has been, and is, our position that the ASTM D-5755 Dust Sample Method provides an accurate index of the asbestos contamination level in surface dust. Further, it has been and is our opinion that the indirect preparation method does not artificially inflate the concentration of asbestos fibers present in a surface dust sample but instead provides accurate information regarding the size and shape of the asbestos structures in such surface dust sample taken from the vicinity of in-place Grace ACM. Our most recent studies described in this report support our position and again demonstrate that Dr. Lee's position is without merit.

To test Dr. Lee's position concerning the ASTM D-5755 Dust sample method an experiment was performed by MAS consultants at the TCC Music Hall attic in Tucson, Arizona. This facility has in-place W.R. Grace's Monokote-3 fireproofing that contains approximately 10% asbestos and the building surfaces under the fireproofing are contaminated with Monokote-3 dust. The TCC experiment consisted of disturbing the Monokote-3 surface dust in the attic using simple cleaning methods while collecting personal air samples using standard sampling techniques. The air samples were analyzed by the direct method using both NIOSH (PCM) and EPA (TEM) procedures. If Dr. Lee is correct in his opinions concerning the characteristics of the asbestos in the settled dust (large non-respirable particles) then air samples should not contain any respirable asbestos structures. It has been stated in the past by Dr. Lee that the direct preparation technique does not disturb the integrity of the collected asbestos structures thereby preserving the size and shape of the fibers. Therefore, if Dr. Lee's opinion concerning the characteristics of the asbestos in settled dust holds true, then when the asbestos containing surface dust is re-suspended in the air no respirable size asbestos fibers should be detected in the directly prepared air samples that were collected during the activity. On the other hand, if Dr. Lee's opinion is in error, and our position

is correct, then the directly prepared air samples should collect respirable size asbestos structures that are characteristic of the asbestos structures measured by the indirect ASTM D-5755 Dust Sample Method since the source of the asbestos fibers in the air samples is from the disturbed asbestos contaminated settled dust samples.

The Tucson TCC experiment proves that Dr. Lee is wrong about his opinions concerning ASTM D-5755-3 Dust Sample Method. The results from our studies demonstrated the following:

1. When the Monoke-3 dust was re-entrained into the breathing zone of the investigators the directly prepared air samples contained significant levels of respirable airborne asbestos fibers and structures as measured by the both PCM and TEM. Dr. Lee's opinion is that no respirable size asbestos structures are contained in the surface dust and therefore none should be contained in the air samples. The Tucson experimental findings do not support Dr. Lee's opinion that only large non-respirable asbestos-containing particles are found in surface dust samples.

2. When the average length and width of the asbestos structures from the directly prepared air samples that were collected at the TCC building, as well as the Arkansas buildings, were compared to the length and width of the asbestos structures in the dust samples collect previously at the TCC building there was little difference in the fiber size averages between the air and the dust samples (see Table 5). Logically if you break something up then the pieces have to get smaller. In this case the asbestos structures are not smaller in the dust sample results as compared to the air sample results. Dr. Lee has stated that the D-5575-3 Dust sample breakups the asbestos structures into smaller components in the dust samples. Again, the Tucson findings do not support Dr. Lee's opinion that the ASTM D-5755-3 Dust Sample Method preparation step breaks up the asbestos structures.

To verify the Tucson study results air and dust samples were re-analyzed form the Lancaster Keist Library work practice ceiling tile replacement study that was performed in 1991. Air and dust samples were compared in the same way as described with the Tucson study. Archived air samples were prepared by the direct method and then compared to the indirect dust samples that were collected at the time of the study. The Lancaster library results confirmed what was found in the Tucson study. That is there were non-encapsulated free respirable fibers found in the direct air samples. Additionally the asbestos structures lengths in the air sample was shorter than the indirect dust sample analysis (see Table 5).

It is clear from these studies that the ASTM D-5755-3 Sample Dust Method provides an accurate asbestos contamination index for surface dust in the vicinity of in-place W.R. Grace's asbestos-containing surface treatment products.

The Tucson TCC study also demonstrated that a simple cleaning activity that involves the disturbance of asbestos-containing surface dust can produce significant airborne asbestos fiber levels as measured by directly prepared air samples using both the NIOSH 7400 PCM and EPA TEM method (see Tables 1 through 4). Also these results are consistent with the directly prepared PCM and TEM analysis from the Lancaster Library study.

The directly prepared air sample results for the Tucson study and Lancaster study demonstrates quite plainly the over all problem with asbestos contaminated surface dust in the vicinity of in-place W.R. Graces asbestos-containing surface treatment products. If asbestos-contaminated surface dust is disturbed in some manner such as routinely happens during maintenance and/or

other building activities, there is a high potential for significant asbestos exposure to either building occupants or maintenance personnel.

The ASTM D-5755-3 Dust Sample Method procedure provides a reliable scientific tool for a qualified asbestos building inspector to evaluate the potential exposure hazard from the presence of asbestos-contaminated surface dust which is disturbed in some manner by either a building occupant or maintenance personnel.

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10/25/06
Date